Smart Modular Actuator

Contact: sswamin1@umd.edu

What is an actuator?

- An actuator is a part of a device or machine that enables movement.
- Traditionally, the Johnson Controls actuators were configured manually.
- An engineer had to install the actuator in a building and then configure it each time by climbing up the ladder.
- This process had to be repeated for thousands of actuators in a building

Background

- I researched an existing method of configuring actuator devices in HVAC (Heating, ventilation, and air conditioning).
- We came up with an innovative solution to overcome the complexity in the existing manual process of configuring these devices and researched extensively to understand the stakeholder needs and to redefine design aims.
- SMA app establishes connections with multiple Wi-Fi-capable smart actuators and configures them in a single shot.
- This process had to be repeated for thousands of actuators in a building.
- The image on the right is a CC3220 circuit board that has been embedded inside the actuator device

Project Vision

- The aim of the project is to to overcome the complexity in the existing manual process of configuring actuator devices.

Features

Scan QR codes of actuators

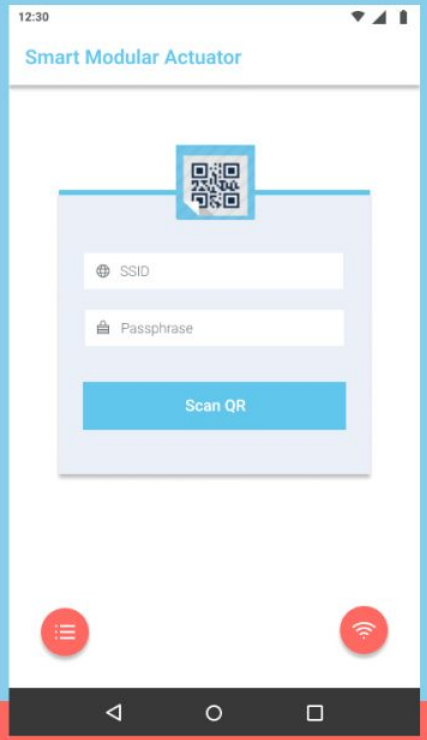
The freshly receeived actuators have QR codes on them whch can scanned for storage

Storage of scanned devices

Once they are scanned, they will be stored in the cloud database

Configure multiple devices

The initial settings information will be sent to multiple WiFi-enabled actuators at the same time.



Features

Wifi scan of nearby devices

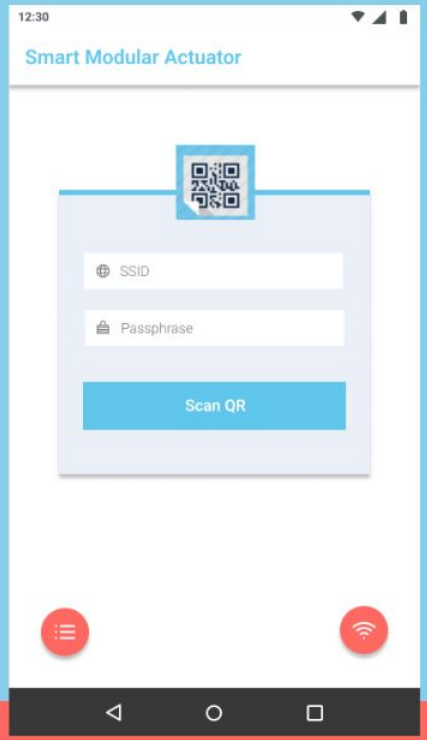
Scans the available actuators in the viscinity

View configuration

Consumers can view the config information of the actuators

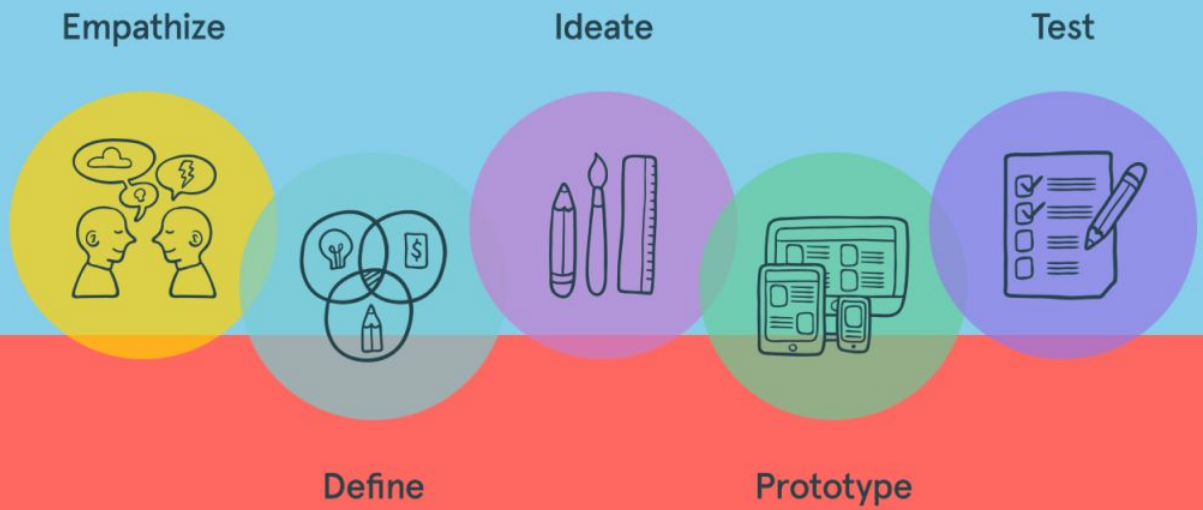
Edit configuration

Consumers can edit the config information of the actuators and configure all the actuators



Design Process

- I chose to follow the design thinking methodology for this project.
- It helped me untangle ambiguity, validate ideas, and structure complex problems.
- The process includes gathering insights about the users, prototyping ideas, and validating them.

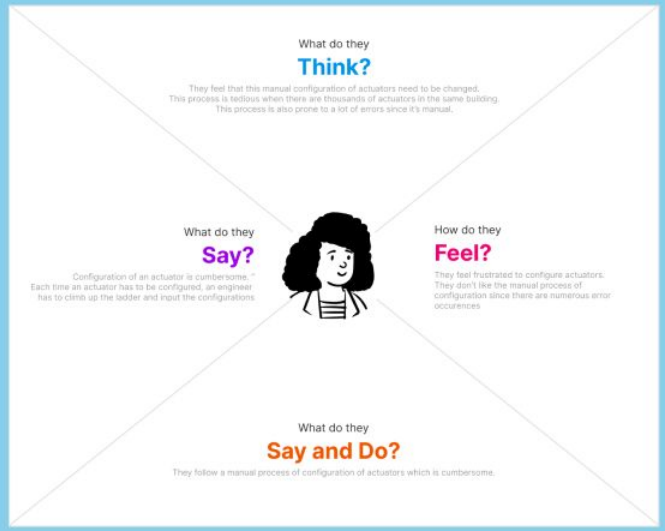


1. Empathize

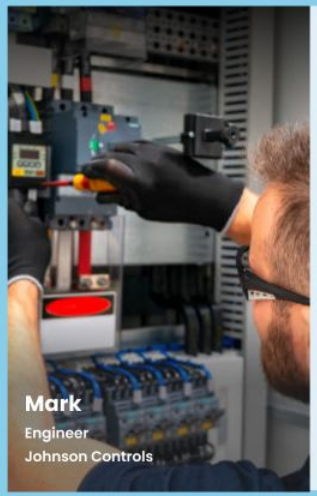
- The purpose of this research was to understand the needs of engineers who configure these actuators, so I conducted interviews with some selected people with various designations (for example, building managers, testers, product managers, and engineers) who come into contact with actuators at different times of the configuration process.
- According to the results of this study, there is a need to change the method of configuration of actuators as it is cumbersome, and there is a risk of errors when the manual way is used.

Empathy Maps

- To better understand the results of the research, I extracted the data from the user interviews and drew empathy maps in order to visualize the results.
- Experience models enabled me to portray user research in ways that tell a story about those users' lives and how they utlised salt in their daily life and what complexities they were facing.
- Research would be incredibly inefficient to absorb, and ineffective to use, if not presented in these models.
- An Empathy Map is a tool that helped me empathise and synthesise my observations from the research phase, and draw out unexpected insights about the user's needs.



User Persona



Actuator configuration is a long, error-prone and cumbersome process.

Background

Mark is an engineer in Johnson Controls. He configures actuators once they are installed in the buildings. He configured hundreds of actuators per day. He also take care of reconfiguration of actuators in case they run into issues.

Goals and Ambitions

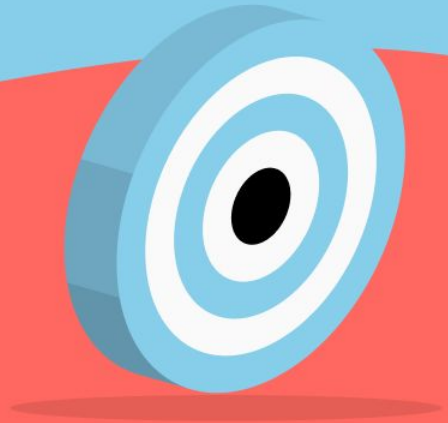
- To become a senior manager.
- Be more innovative
- To start a family and have children.

Frustrations

- When configuration of actuators fail
- Reconfiguration of actuators

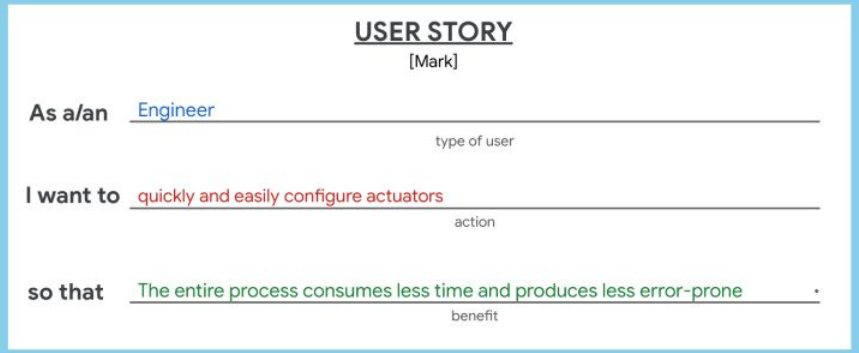
2. Define

- The first step was to gather user research which I completed using empathy maps and I created a handy user persona from that.
- Mark is an engineer in Johnson Controls. He configures actuators once they are installed in the buildings.
- He configures hundreds of actuators per day.
- He also take care of reconfiguration of actuators in case they run into issues.
- It involved accumulating the data from the observation stage to define the design problems and challenges.
- The define stage is where I established a clear idea of exactly which problem I am trying to solve for the user.



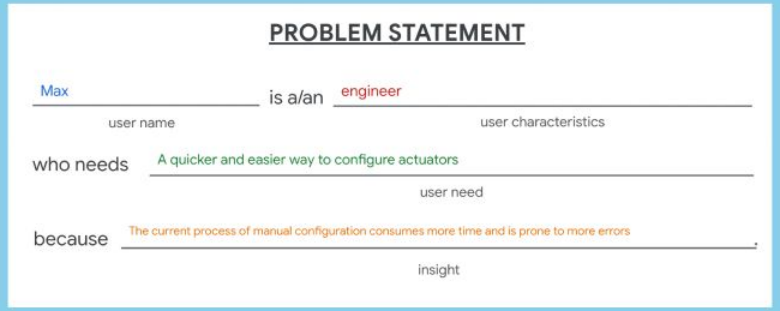
User Story

- I created a user story that does not spell out the exact feature, but rather what the user aims to achieve, that gave me the freedom to identify the best possible way to implement the feature.
- By identifying pain points of the user, I was able to create a design that is tailored to users' needs.
- The end result is a great user experience.
- I learned that each user story includes a hero, goal, and a conflict.



Problem Statement

- It is essential to come up with a solution that helps in configuring actuators quickly, easily, and error-freely. The goal is to develop a solution that can solve this pain point.

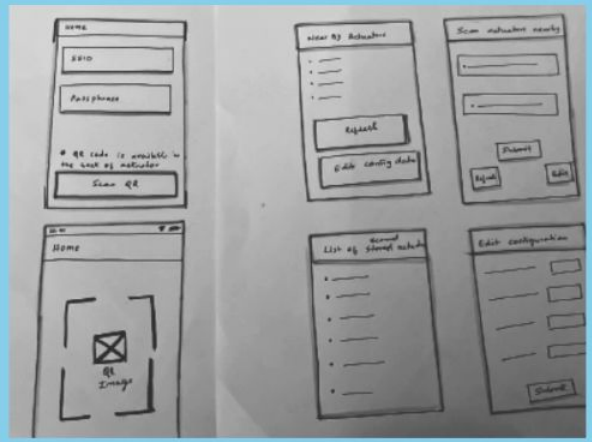


3. Ideate

- I took the user's pain points learnt from the user research studies.
- Then I used this list from the Stanford d.school to begin generating ideas by asking how might we: Amp up the good? Change a status quo? Break the point-of-view into pieces?
- I generated ideas using the How Might We framework to help me generate many ideas that I can choose from to help solve users' problems.
- The goal of this activity is to come up with many possible design ideas.
- Some will be usable, and some won't, but going through this process gave a better idea of what might work.

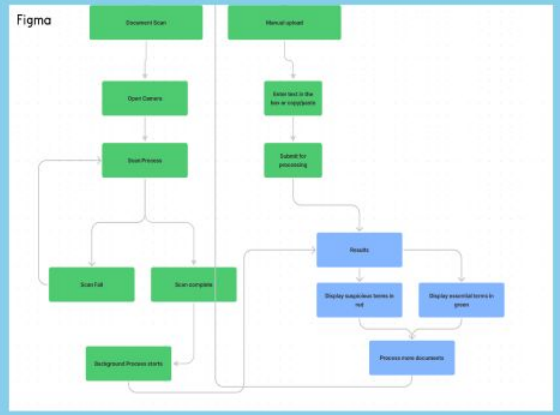
Crazy Eights Technique

- The Crazy 8 Method was the first one I used to allow for more flexibility and iterations in our designs in the initial stages.
- I sketched out several possible solutions, then analyzed the ideas to determine which would be the best.



Sitemap

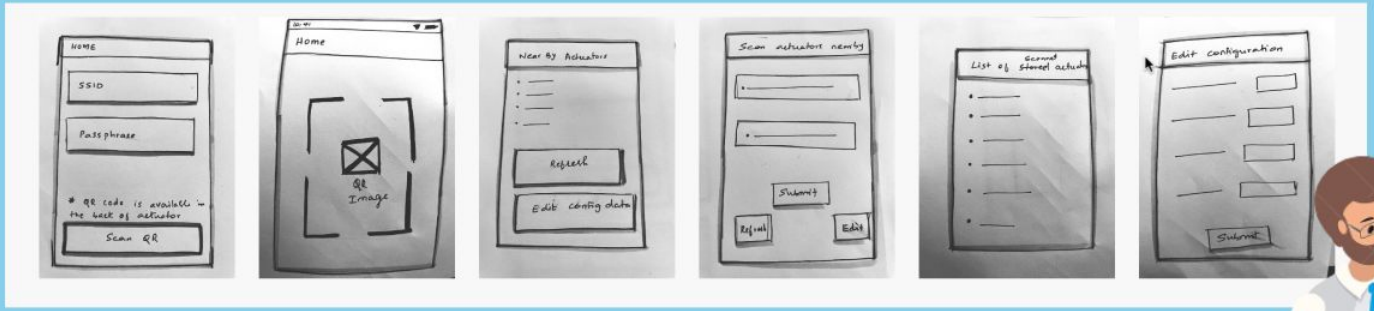
- I separated specific tasks into categories while creating user stories for the important ones to focus on.
- As a result, I narrowed my focus by addressing each problem I found from my research, such as how to configure an actuator using the inbuilt wifi capability, how to repeat the same process for multiple devices, how to reduce the time taken to repeat the process, etc.
- Sitemaps help outline the pages of the app need to design and can help in spotting necessary pages that you've forgotten to include, need to remove, or need to combine.
- A hierarchical sitemap outlines the relationship between pages in order of importance.



4. Prototype : P&P Sketches

- Sketching things out first and circulating them helps show the product's process and iterative development.
- It feels like I am taking myself, my team, and my clients on a journey from day one.
- The following sketches help to problem solve like figure out the user flows, communicate ideas with the engineering team, develop quick concepts, eliminate any ideas that won't work quickly and easily, devloping the user journey and information architecture.

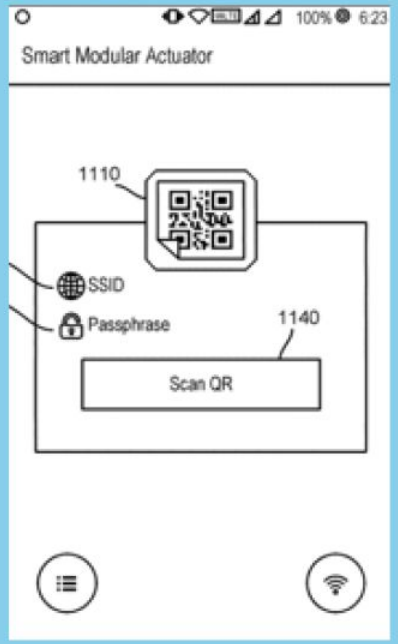
4. Prototype : P&P Sketches

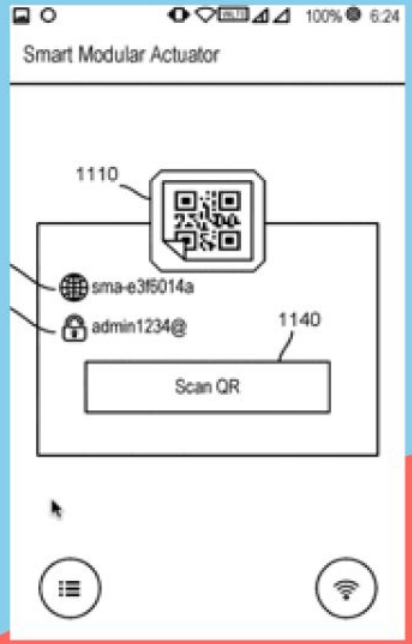


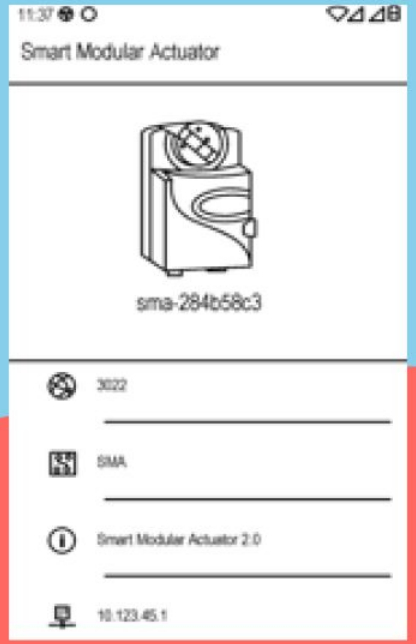
4. Prototype : Wireframes

- I used digital tools like Balsamiq to convert paper wireframes and prototypes into collaborative digital tools.
- This helped me clarify my progress to the rest of the team, which consisted of engineers and product managers.
- One advantage of digital wireframes is that they are clear: they can be shared instantaneously and converted into digital prototypes easier.

4. Prototype : Wireframes







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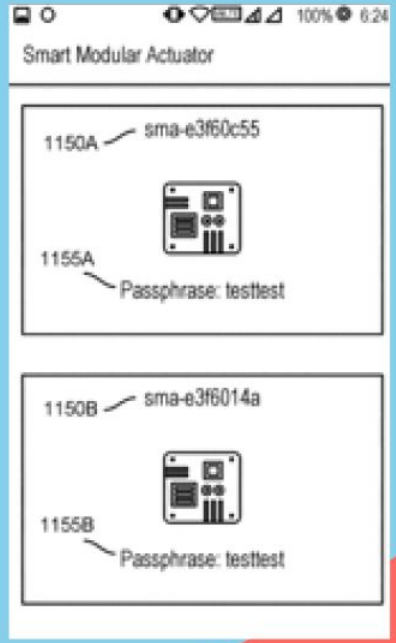
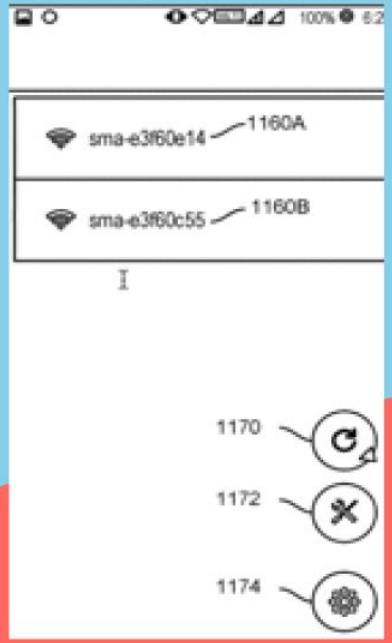
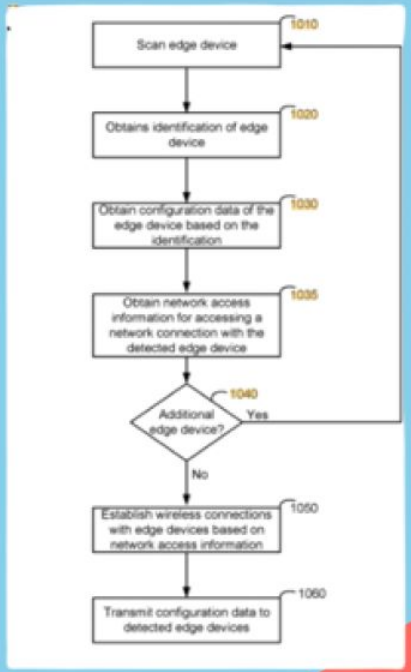


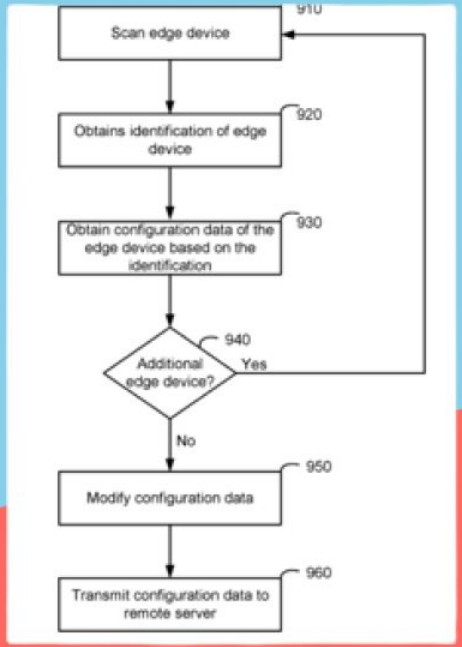


4. Prototype : Userflows

- The following diagrams display a user's complete path when using a product. The user flow lays out the user's movement through the product, mapping out every step the user takes—from the entry point from scanning the QR codes and right through to the final interaction of configuration.

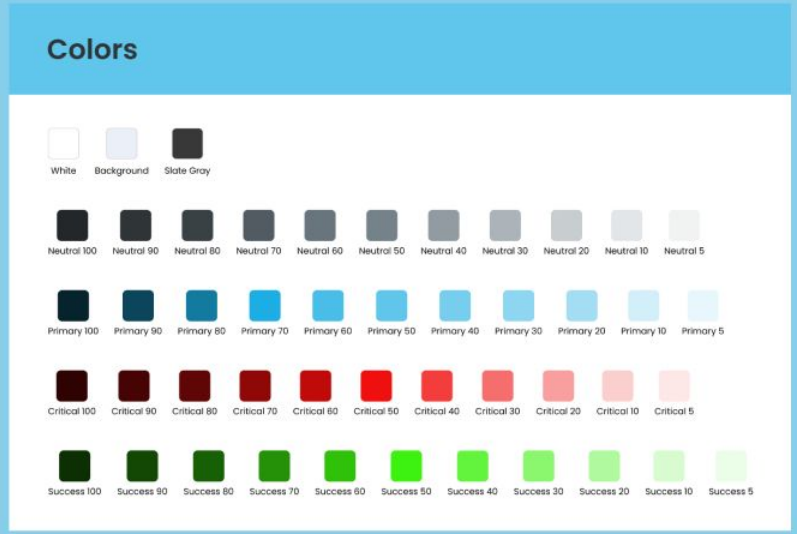
Userflows


Scan edge device
1010
Obtains identification of edge device
1020
Obtain configuration data of the edge device based on the identification
1030
Obtain network access information for accessing a network connection with the detected edge device
1035
Additional edge device?
1040
Yes
No
Establish wireless connections with edge devices based on network access information
1050
Transmit configuration data to detected edge devices
1060


Scan edge device
910
Obtains identification of edge device
920
Obtain configuration data of the edge device based on the identification
930
Additional edge device?
940
Yes
No
Modify configuration data
950
Transmit configuration data to remote server
960

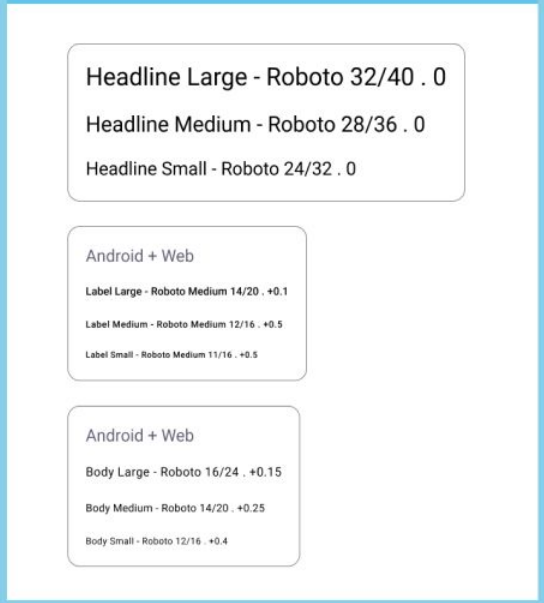
Color Style

- Blue has been chosen as a color that law enforcement officers worldwide will use. Do you know why? The idea behind blue uniforms is that blue should represent an authoritative but calm and confident figure, just like its color.
- Blue is the color of trust. It suggests loyalty and integrity, which is why it is a great choice for businesses that want to project dependability, security, and peacefulness.
- With red kicking in as the secondary color, it should evoke a feeling of confidence and security. According to color psychology, green-based colors make people calmer and less anxious.



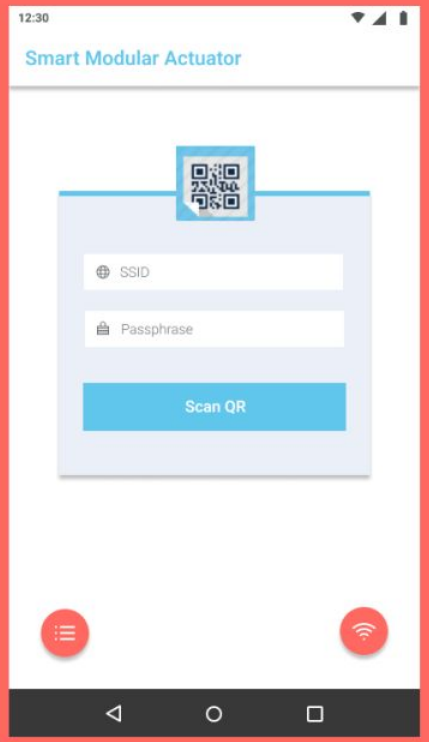
Typography

- Roboto is a sans serif typeface created for use in user interfaces and web design for legibility and effortless reading.
- As Roboto offers a wide range of weights to suit a wide range of sizes, it provides a clear header and an easy-to-read body text.
- The physical appeal of Roboto - is modern, approachable, and friendly, but not casual; geometric lines with rounded curves. It has the flexibility of its use



Final Designs

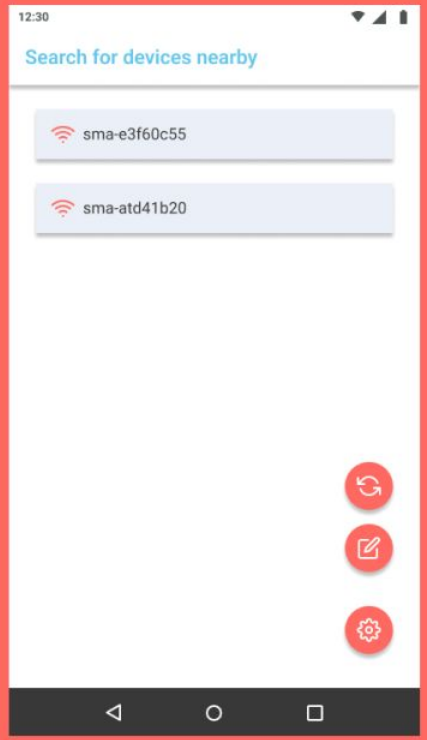
Home Screen



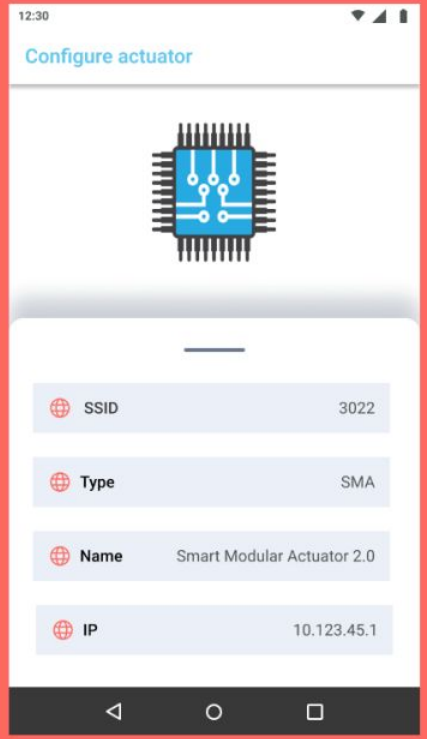
Scan QR Code

Home Screen: After Scanning Actuator

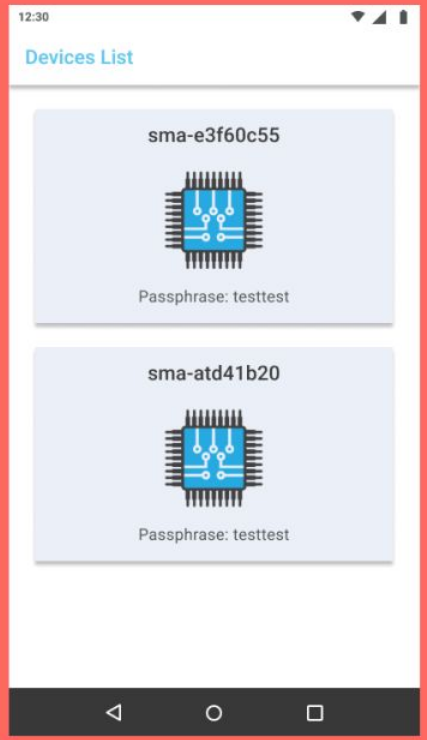
Search For Nearby Devices



Configure Actuator



Scanned Devices List



Takeaways

- Smart Modular Actuator helped me understand how tough it can be to manually configure numerous actuators.
- This served as a springboard to ideate many different solutions to solve this issue.
- I am glad that I was there from the start of the project (empathising with users) till the development of this ideal solution as an android app.
- I got to witness my design turn into reality which was rewarding.